

Nietzsche for physicists

J. C. S. Neves*

Instituto de Matemática, Estatística e Computação Científica, Universidade Estadual de Campinas, CEP. 13083-859, Campinas, SP, Brazil

Abstract

One of the most important philosophers in the history, the German Friedrich Nietzsche, is almost ignored by physicists. The author who stated the death of God in 19th century was a science enthusiast, mainly during the second part of his work. With the aid of the physical concept of force, Nietzsche created his concept of will to power. Thinking about the energy conservation, the German philosopher had some inspiration for creating his concept of the eternal recurrence. In this article, one points out some influences of physics on Nietzsche and discusses the topicality of his epistemological position—the perspectivism. From the concept of will to power, I propose that the perspectivism leads to the interpretation where physics, and science in general, is viewed as a game.

1 Introduction: an obscure philosopher?

The man who said “God is dead” (GS §108)¹ is a popular philosopher around the world. Nietzsche is a strong reference in philosophy, psychology, sociology and arts. But is there any Nietzsche’s influence on natural sciences, especially on physics? Among the physicists, and scientists in general, the

*nevesjcs@ime.unicamp.br

¹The Nietzsche’s works are indicated by the initials, with the correspondent sections or aphorisms, established by the critical edition of the complete works edited by Colli and Montinari (Nietzsche, 1978). The *Birth of Tragedy* is BT, *Human, all too Human* is HH, *Gay Science* is GS, *Beyond Good and Evil* is BGE, *Ecce Homo* is EH, *Twilight of the Idols* is TI, *On the Genealogy of Morality* is GM, *On Truth and Lying in a Non-Moral Sense* is TL, and the posthumous fragments (or notebooks) are PF, indicated by its numbers and years.

thinker who created a philosophy which is contrary to the Platonism is known as an obscure or irrationalist philosopher. However, contrary to the popular ideas, Nietzsche was a critic of the absolute rationalism but was not an irrationalist. Nietzsche criticized the hubris of the reason (the Socratic rationalism²): the belief that the mankind could be guided only by reason. That is, the German philosopher was a hard critic of the Enlightenment³ (or *Aufklärung* in German) as an equivocated idea, according to him, of salvation and redemption by means of the reason. Nietzsche accused the hubris of the reason,⁴ but the philosopher did not deny the reason. As we shall see, this is clear from the Nietzsche's formation (*Bildung*). Among his references, there are several natural philosophers or/and scientists. Nietzsche was a reader of Charles Darwin (at least the Darwinian ideas), Hermann von Helmholtz, Roger Boscovich and others. He attempted to be informed by the scientific debate during the 19th century. Then, the philosopher who is considered a poet (and *Thus Spoke Zarathustra* is poetry as well) never denied the importance of science. Of course, his scientific view was different, and Nietzsche thought about science from another point of view—by using his perspectivism.⁵

According to researches in Nietzschean philosophy, the author's works are divided in three periods. In the first one, there exists the approximation with Romanticism, Schopenhauer and the German musician Richard Wagner. In the second one, Nietzsche breaks off his friendship with Wagner and keeps away from Romanticism and Schopenhauer's influence. The third part is the period where the Nietzschean philosophy acquires its "identity" and originality. The science's influence on Nietzsche is present in all periods. But from the second period, this influence is more clear. In a book of this period, *Human, all too Human*, Nietzsche says: "Optimism, for the purpose of restoration" (HH II, Preface 5). That is, Nietzsche identifies science with optimism (since his very first book, *The Birth of Tragedy*, where the

²Socrates, who according to Nietzsche, is "the archetype of the theoretical optimist", had "the imperturbable belief that thought, as it follows the thread of causality, reaches down into the deepest abysses of being, and that it is capable, not simply of understanding existence, but even of *correcting* it" (BT §15).

³The philosopher suggests a new Enlightenment in several texts. See, for example, the fragments 25 [296], 26 [298], 27 [79] and 27 [80] of 1884.

⁴In *On the Genealogy of Morality* one reads: "*Hubris* today characterizes our whole attitude towards nature, our rape of nature with the help of machines and the completely unscrupulous inventiveness of technicians and engineers" (GM III §9).

⁵I will discuss this cardinal concept in Nietzschean philosophy in section 4.

Socratism is criticized) and emphasizes the beginning of a process of cure. The philosopher recovered his health with aid of the science. And his illness was the Schopenhauer's pessimism and Wagner.

In *On the Genealogy of Morality*, Nietzsche reveals the task of science in our time, the modernity: “All sciences must, from now on, prepare the way for the future work of the philosopher: this work being understood to mean that the philosopher has to solve the *problem of values* and that he has to decide on the *rank order of values*” (GM I §17). Therefore, as we can see, the importance of science in Nietzschean philosophy transcends the scientific realm.

As we have already seen, among the Nietzsche's influences is the multifaceted Roger Boscovich. In the next section, we shall see the importance of the concept of force from physics (due to Boscovich) for constructing his concept of will to power (*Wille zur Macht*). From that concept, will to power, Nietzsche builds his cosmological view: the eternal recurrence of the same, as we shall see in section 3. His epistemological position, the perspectivism, is presented in section 4 with an application to two problems in modern physics: wave-particle duality and the gravitational phenomenon. In section 5, I use the concepts of will to power and perspectivism to interpret the physics—and science in general—as a game.

2 The physics in Nietzsche's main concepts

The Croatian thinker Roger Boscovich (physicist, mathematician, philosopher, etc.) was a decisive reference on Nietzsche's philosophy. The Nietzsche's reading of Boscovich's concept of force was an essential ingredient to construct his famous concept of will to power. In the 18th century, Boscovich researched body collisions. From his research, the Croatian concluded that matter is manifestation of forces. According to the physicist and physics historian Max Jammer (Jammer, 1999, p. 178), for Boscovich “impenetrability and extension [...] are merely spatial expressions of forces, ‘force’ is consequently more fundamental than ‘matter’ [...]”. Nietzsche confirms that idea and in *Beyond Good and Evil* writes: “Boscovich taught us to renounce belief in the last bit of earth that *did* ‘stand still,’ the belief in ‘matter,’ in the ‘material,’ [...]” (BGE §12). Such as Boscovich, Nietzsche emphasizes the concept of force (*Kraft*) to the detriment of matter (*Materie*). The ma-

terial world is manifestation of forces, which, in the Nietzschean case, as we shall see, are translated by wills to power.

For Nietzsche, the physical concept of force was important but was an empty word. In a posthumous fragment, apart from irony, this is clear: “The triumphant concept of ‘force’, with which our physicists have created God and the world, needs supplementing: it must be ascribed an inner world which I call ‘will to power’ [...]” (PF 36 [31] of 1885). In another fragment the idea is stressed: “A force we cannot imagine (like the allegedly purely mechanical force of attraction and repulsion) is an empty phrase and must be refused rights of citizenship in *science*” (PF 2 [88] of 1885). Will to power, according to the Nietzsche’s thought, completes the concept of force.

A will to power is a quantum of power, it is “characterised by the effect it exerts and the effect it resists [...]”. The quantum of power is essentially a will to violate and to defend oneself against being violated. Not self-preservation” (PF 14 [79] of 1888), said the philosopher. In this sense, the becoming is considered as result of intentions of increasing power, it is not considered as result of intentions of “self-preservation”.⁶ Above all, Nietzsche writes, “everything that happens out of intentions can be reduced to the *intention of increasing power*” (PF 2 [88] of 1885). Therefore will to power means that everything, whether organic or inorganic, “wants” to increase power. Such a quantum of power is neither a metaphysical concept nor a substance, it can not be confused with a being: “the will to power not a being, not a becoming, but a *pathos*, is the most elementary fact, and becoming, effecting, is only a result of this...”⁷ (PF 14 [79] of 1888).

By using the concept of force, in a famous fragment, Nietzsche says what the world is:

And do you know what “the world” is to me? [...]. This world: a monster of force, without beginning, without end, a fixed, iron quantity of force which grows neither larger nor smaller, [...] a play of forces and force-waves simultaneously one and “many” [...] — *This world is the will to power — and nothing besides!* (PF 38 [12] of 1885).

⁶This is the point where Nietzsche finds his disagreement over Darwinian theory.

⁷We must be careful about the use of “fact” in that fragment. As we shall see, Nietzsche denies any fact defended by the Positivism. The Greek word *pathos* may be translated by affect as well.

The world as will to power can be viewed as forces struggling for more power. And a similar fragment to 2 [88] of 1885 is found, but in this case it is indicated the concept of force: “All that happens, all movement, all becoming as a determining of relations of degree and force, as a *struggle...*” (PF 9 [91] of 1887). There is no goal for all events, “for all that happens”, then Nietzsche denies any shadow of teleology as we can see in the fragment 36 [15] of 1885:

If the world had a goal, it could not fail to have been reached by now. If it had an unintended final state, this too could not fail to have been reached. If it were capable at all of standing still and remaining frozen, of “being”, if for just one second in all its becoming it had this capacity for “being”, then in turn all becoming would long since be over and done with, and so would all thinking, all “mind”. The fact of “mind” *as a becoming* proves that the world has no goal and no final state and is incapable of being.

The fragment above shows his refusal to accept an ultimate goal, and this is the reason for rejecting the heat death of the universe (including the second law of thermodynamics), which was already debated during his life.

The world as will to power may be read both in the singular or plural forms.⁸ In the singular one, the world is will to power. There is nothing beyond or “nothing besides!” There is no any metaphysical world. Nietzsche denies a metaphysical world and, such as Spinoza,⁹ considers the nature and mankind the same thing. Nietzsche, in a sense, naturalizes the man. Will to power in the plural means a finiteness of forces. The natural and the human worlds are manifestations of forces or wills to power.

The importance of the concept of force in Nietzsche, besides the concept of will to power, is essential to his cosmological view. And the Nietzschean cosmology is the so-called eternal recurrence of the same.

⁸See also Müller-Lauter (1993) for an abundant discussion on these two forms of facing the will to power.

⁹In Spinoza (2002, part III) the philosopher criticizes those that have considered “man in Nature as a kingdom within a kingdom”.

3 The eternal recurrence of the same

Somehow the eternal recurrence of the same (*die ewige Wiederkehr des Gleichen*) is one the most intriguing concepts in Nietzschean philosophy. In the published works, it appears for the first time in *Gay Science*, a book of 1882, in the section or aphorism called *The heaviest weight*:

What if some day or night a demon were to steal into your loneliest loneliness and say to you: “This life as you now live it and have lived it you will have to live once again and innumerable times again; and there will be nothing new in it, but every pain and every joy and every thought and sigh and everything unspeakably small or great in your life must return to you, all in the same succession and sequence [...]. The eternal hourglass of existence is turned over again and again, and you with it, speck of dust!” Would you not throw yourself down and gnash your teeth and curse the demon who spoke thus? Or have you once experienced a tremendous moment when you would have answered him: “You are a god, and never have I heard anything more divine.” If this thought gained power over you, as you are it would transform and possibly crush you; the question in each and every thing, “Do you want this again and innumerable times again?” would lie on your actions as the heaviest weight! [...] (GS §341).

In this formulation, the eternal recurrence appears to be an ethical thought or challenge. That is, Nietzsche points out to a life experience where each singular moment or “every thing” must be approved. To live each moment—approving it and confirming it—, it is necessary to accept the possibility of the repetition of all life infinite times, “all in the same succession and sequence”. For an affirmative person, each moment is accepted such it is. This is the supreme “yes” to existence, according to Nietzsche. In *Ecce Homo* the philosopher stresses that the eternal recurrence is the “highest possible formula of affirmation” (EH, *Thus Spoke Zarathustra* §1). On the other hand, the nihilist, who denies the sensible world or the single world,¹⁰ is not able

¹⁰Plato, according to Nietzsche, is considered nihilist because he created the ideal world, the world “where” the Ideas live. Rejecting the sensible world, Plato formulated the True World against the illusory world (the sensible world). In the same way, Nietzsche accuses the Christianity because the “Christianity is Platonism for the ‘people’” (BGE, Preface).

to say “yes” and confirm the existence. Then the eternal recurrence, in this formulation, is a necessary condition to overcome the nihilism.¹¹

3.1 A cosmological interpretation

In another point of view, the eternal recurrence is a cosmology or a cosmological interpretation.¹² The Nietzschean ingredients for this cosmological point of view are: (1) the forces are both finite and conserved and (2) the time is infinite. In our language today in physics, the first one may be translated by the finiteness of the energy in the observable universe. Moreover, Nietzsche considers force as a conservative quantity. In his thought, this is translated by the first law of thermodynamics.¹³ And the philosopher comments about this law and its relation with eternal recurrence: “The principle of the conservation of energy demands *eternal recurrence*” (PF 5 [54] of 1886). The second one is the eternity of the cosmos. For Nietzsche, the recurrence of “all in the same succession and sequence” is possible with eternity and finite forces. All force configurations, within the eternity, according to Nietzsche, would repeat its states. In a sense, Nietzsche works in the same direction of Poincaré,¹⁴ who stated the “eternal recurrence theorem” years after the German philosopher to begin his first thoughts on the physicality of his concept.

Contrary to the ethical version, the eternal recurrence of the same, as a scientific thought, appears mainly in the posthumous fragments. One of the most important is the fragment 14 [188] of 1888, called *The new world-conception*, where Nietzsche writes¹⁵:

In *Twilight of the Idols* it is written: “The true world is gone: which world is left? The illusory one, perhaps?... But no! *we got rid of the illusory world along with the true one!*” (TI, *How the true world finally became a fable* §6). In a sense, Nietzsche assumes only one world, this world. Then his philosophy is immanent.

¹¹The nihilism, the “uncanniest of guests”, presents several consequences. In the fragment 2 [127] of 1885, the philosopher shows its consequences on science, politics and arts.

¹²See also Krueger (1978), Nehamas (1980), Marton (1990) and D’Iorio (2011) for discussions on the cosmological meaning of this Nietzschean concept. In Neves (2013, 2015), one presents this discussion from our state of the art in cosmology. Neves (2013) discusses the possibility of eternal recurrence by means of the scientific knowledge today. Nietzsche himself said that the eternal recurrence “is the most scientific of all possible hypotheses” (PF 5 [71] of 1886).

¹³As we have already seen, the philosopher was a critic of the second law of thermodynamics. But the first law was welcomed by him.

¹⁴A historical description of the Nietzschean eternal recurrence and its similarity to the Poincaré’s theorem is found in Brush (1976, vol. II, p. 628). This similarity is stressed in D’Iorio (2011) as well.

¹⁵This fragment was translated by me directly from critical edition Nietzsche (1978).

If the world may be thought of as a determined quantity of forces and as a determined number of centers of force—and every another representation remains undetermined and therefore unusable—thus it follows that, in the great dice game of the existence, it experienced a calculable number of combinations. In an infinity time, every possible combination would be sometime reached one time; even more, it would be reached infinite times.

As we can see, the two ingredients are present. The first one is indicated by “determined quantity of forces”, and the second one can be read directly.

The attempts of “proving” the eternal recurrence by using scientific concepts can be viewed, according to the arguments in Neves (2013), as an expedient used by the philosopher for attracting readers. A scientific form for the eternal recurrence is more acceptable to people immersed in a scientific culture as we are since the beginning of modernity.

3.2 The possibility of an eternal universe

Today the cosmology is typically Einsteinian. From solutions of Einstein or Einstein-type equations, cosmological models have been constructed. And one of the most important features in these cosmological solutions is the problem of the initial singularity. In the cosmological standard model (Λ -CDM model), the initial singularity is called Big Bang. It is interpreted as the initial state of the universe, a singular state where physical quantities diverge. There exists a common belief that the Big Bang is a breakdown of the Einstein’s equations, and a quantized gravitation will solve this problem. However one has possible solutions of this problem without the complete quantum theory of gravity. Bouncing cosmologies (a review is presented in Novello and Perez Bergliaffa 2008) appear today as a possibility to avoid the initial singularity. By assuming violations in energy conditions,¹⁶ and these violations are acceptable since the observation of cosmic accelerated expansion, regular solutions come from the Einsteinian gravitation. In this perspective, the singularity is replaced by a regular transition between a contraction phase and an expansion phase (where we live today). There exists the possibility of constructing cyclic cosmologies in such contexts, where the universe passes through successive phases of contraction and expansion.

¹⁶Such conditions involve the pressure and energy density of the cosmological fluid. This fluid is a good approximation to describe the universe’s matter content.

The ekpyrotic cosmology (Lehners, 2008), whose name is inspired by the Stoicism, presents a cyclic cosmology. Moreover, this cosmology provides solutions to the typical problems of standard model (the flatness, isotropy, homogeneity and horizon problems) without the inflationary mechanism. That is, the qualities of the inflationary mechanism, which appear during the exponential expansion when the universe was young, are replaced by the ekpyrotic phase, a slow contraction cosmic phase before the current expansion phase. This contraction phase defines the ekpyrotic cosmology. During the contraction phase, besides the solved problems of standard cosmology, there exists the generation of quantum fluctuations which are responsible for the structure formation (structures such as galaxies). In the Λ -CDM model, this achievement is due to the inflation. Then the initial singularity problem or the Big Bang problem, the typical standard model problems and the structure formation may be solved by adopting an alternative cosmological model.¹⁷

Contrary to the critics and some Nietzschean scholars, a cyclic cosmological model is possible today even in Einsteinian theory (the ekpyrotic cosmology may be thought of as an effective theory in general relativity realm). The door is open to a “new” point of view,¹⁸ where the cosmos is viewed as uncreated, i.e., it is immanent and eternal. The strange death of God, emphasized by Nietzsche, has several meanings: one of the most important is related to the question on the cosmos’ eternity. And the modern rationality may refuse the Creator or the Demiurge for the universe, in such a way forbidding the Big Bang as an instant of creation because, above all, that instant may be viewed as a shadow of the dead God.¹⁹

The question on the possibility of recurrence of the *same* is still an open issue because the knowledge on the structure formation (galaxies and galaxy

¹⁷In black hole physics it is possible to solve the problem of singularities within the Einsteinian context as well (see Neves and Saa 2014). In particular, the singularity inside the black holes is removed by a determined energy violation.

¹⁸A cyclic view of the cosmos is an old idea. Even Nietzsche writes that “The doctrine of the ‘eternal return’, which is to say the unconditional and infinitely repeated cycle of all things — this is Zarathustra’s doctrine, but ultimately it is nothing Heraclitus couldn’t have said too. At least the Stoics have traces of it, and they inherited almost all of their fundamental ideas from Heraclitus” (EH, *The Birth of the Tragedy* §3).

¹⁹See the aphorism 108 from *Gay Science*, where the philosopher writes: “God is dead; but given the way people are, there may still for millennia be caves in which they show his shadow. — And we — we must still defeat his shadow as well!”. The thesis that the Big Bang may be interpreted as God’s shadow is supported in Neves (2013).

clusters), the black holes evaporation in the contraction phase and the thermodynamic problem (the entropy increase in each expansion phase) are not totally solved within our science today. Such as Nietzsche points out, his *Gedankenexperiment*, his idea of eternal recurrence as a thought experiment, assumes the eternal repetition of the same states for generating ethical consequences, “all in the same succession and sequence”.²⁰

4 Perspectivism as an epistemological position

The Nietzschean perspectivism,²¹ or his epistemological position, is indicated in a frequently cited posthumous fragment of 1886:

Against the positivism which halts at phenomena — “There are only facts” — I would say: no, facts are just what there aren’t, there are only interpretations. We cannot determine any fact “in itself”: perhaps it’s nonsensical to want to do such a thing. “Everything is subjective,” you say: but that itself is an *interpretation*, for the “subject” is not something given but a fiction added on, tucked behind. — Is it even necessary to posit the interpreter behind the interpretation? Even that is fiction, hypothesis.

Inasmuch as the word “knowledge” has any meaning at all, the world is knowable: but it is variously *interpretable*; it has no meaning behind it, but countless meanings. “Perspectivism” (PF 7 [60] of 1886).

Denying the thing-in-itself,²² the fact or the positivism belief, the final truth (because there is no “being” and the becoming has no goal) and any truth behind or beyond the sensible world (there is no a metaphysical world), Nietzsche claims the perspectivism. The knowledge is perspectivistic, it is

²⁰There exists a debate on the recurrence: is the recurrence of the same or of the different? I agree with Krueger (1978) because only the recurrence of the same would have an impact on ethical issues.

²¹There is an intense debate on the Nietzschean perspectivism. See, for example, Anderson (1998) on the truth and objectivity in Nietzsche’s perspectivism and the book organized by Babich (Babich, 1999), which possesses several works on the topicality of this philosophical position.

²²“The ‘thing-in-itself’ absurd. If I think away all the relationships, all the ‘qualities’, all the ‘activities’ of a thing, then the thing does *not* remain behind” (PF 10 [202] of 1887).

something *human, all too human*. In a sense, Nietzsche follows Kant and points out to the dependence of the human conditions (body structure in the Nietzschean case) to generate knowledge. According to the Zarathustra's author, even the physics is a perspective or an interpretation, as we can read in *Beyond Good and Evil*: "Now it is beginning to dawn on maybe five or six brains that physics too is only an interpretation and arrangement of the world (according to ourselves! if I may say so) and *not* an explanation of the world" (BGE §14). The world with its "ambiguous character"²³ has become infinite, according to the aphorism *Our new "infinity"*: "the world has once again become infinite to us: insofar as we cannot reject the possibility *that it includes infinite interpretations*" (GS §374). Interpretations which do not reveal any fact or something behind or beyond the sensible world.

In a provocative form, Nietzsche, as a philologist by trade, criticizes the physicists and their notion of law of nature:

You must forgive an old philologist like me who cannot help maliciously putting his finger on bad tricks of interpretation: but this "conformity of nature to law," which you physicists are so proud of, just as if — exists only because of your interpretation and bad "philology." It is not a matter of fact, not a "text," but instead only a naive humanitarian correction and a distortion of meaning that you use in order to comfortably accommodate the democratic instincts of the modern soul! "Everywhere, equality before the law, — in this respect, nature is no different and no better off than we are" [...]. But, as I have said, this is interpretation, not text [...] (BGE §22).

The old philologist shows the historical and temporal feature of the knowledge. Our "fixation" on the laws of nature, according to Nietzsche, is a feature of the modernity. The knowledge is created today in such a form by assuming concepts, like the concept of isonomia or equality before the law, which are values for us. Once again, it is emphasized, in the above quotation, that the scientific knowledge does not reveal a fact or a "text".

Let us use the Nietzschean perspectivism to look at two questions in modern physics, the wave-particle duality and the gravitational phenomenon, and enrich our discussion on this philosophical concept.

²³See GS §373.

4.1 Wave or particle?

Back to the modern physics, the Nietzschean perspectivism may help us. With aid of Nietzsche, dichotomies are banned. For example, the wave-particle duality in quantum mechanics. What is the true reality on the matter in quantum mechanics realm? Wave or particle? For the Nietzschean philosophy, both or neither! Both because wave and particle are working interpretations, scientific perspectives on the sensible world (and we shall see what is the meaning of “working interpretations”). Neither because these interpretations do not show facts or the thing-in-itself. That is, for Nietzsche, there is no any perfect correspondence between mind and “reality”. Because the “reality” such as we know, the “reality” given by concepts is not a thing-in-itself, it is a product of human interpretations.²⁴ Nietzsche rejects the naive realism. Moreover, the philosopher rejects the Platonic idealism and the possibility of existing mathematical entities. The latter rejection is indicated in a posthumous fragment: “The mathematics contains descriptions (definitions) and conclusions from definitions. Its objects do not exist. The truth from its conclusions depends on the correctness of the logical thought” (PF 25 [307] of 1884).²⁵ The mathematics is grounded on the error, i.e., “the laws of numbers was made on the basis of the error, dominant even from the earliest times, that there are identical things” (HH I §19). Denying the identity,²⁶ such as Heraclitus, and the basis of the classical logic, Nietzsche indicates that even the mathematics is a human creation. Then it is clear to the Nietzschean philosophy that the debate on the reality of the wave function in quantum mechanics, for example, is “solved”. The wave function is only a tool to interpret (itself is an interpretation!).

4.2 Force or space-time curvature?

Another problem in modern physics: what is the true nature of the gravity? Is the gravity expressed by force or space-time curvature? Is the Einsteinian theory (or something else in the future) the true or the final answer on the gravitational problem? According to Nietzsche, the final answer is only an

²⁴It must be emphasized that Nietzsche was not a solipsism enthusiast.

²⁵This fragment was translated by me directly from the critical edition Nietzsche (1978).

²⁶“The predominant disposition, however, to treat the similar as identical – an illogical disposition, for there is nothing identical as such – is what first supplied all the foundations for logic” (GS §111).

illusion. Nietzsche denies a final knowledge or a final truth (and even his point of view is an interpretation, a provisional perspective).²⁷ An absolute point of view is an absurd and contains a contradiction in terms²⁸ because every perspective is provisional, temporary. In this sense, both gravitational theories (Newtonian and Einsteinian) are true during some period. Within Nietzschean philosophy, the truth, in general, has a polemical definition given by an early text of 1873, *On Truth and Lying in a Non-Moral Sense*. The philosopher asks *what is the truth?* and answers:

[The truth is] a mobile army of metaphors, metonymies, anthropomorphisms, in short a sum of human relations which have been subjected to poetic and rhetorical intensification, translation, and decoration, and which, after they have been in use for a long time, strike a people as firmly established, canonical, and binding; truths are illusions of which we have forgotten that they are illusions, metaphors which have become worn by frequent use and have lost all sensuous vigour, coins which, having lost their stamp, are now regarded as metal and no longer as coins (TL §1).

The classical philologist (a young philologist when he wrote that text) indicates in the above quotation the truth as “human relations” or as perspective, as it will be said years later. Specifically, in Nietzschean philosophy, the scientific truth only means: it works for the purposes of subsistence of the type (the scientist is one of several types) and obeys specific rules, which, in the physics case, are both mathematical and empirical. Both rules are interpretations. The first one we have already seen. The second one is stressed in modernity, because both the divine and the metaphysical criteria of truth are rejected. Above all, the empirical obligation (and the scientificity) is motivated by the will to truth (*Wille zur Wahrheit*). According to Nietzsche, the will to truth is grounded on the morality, because the scientist—by assuming the empirical obligation—says: “I will not deceive, not even myself” (GS §344). Even without God (because “God is dead” in modernity) and the metaphysical world (the True World is a fable), the will to truth remains as a dominant impulse which seeks for stability, identity. In our scientific

²⁷“Granted, this is only an interpretation too – and you will be eager enough to make this objection? – well then, so much the better” (BGE §22).

²⁸See BGE §16.

time it appears directly related to the sensible world, i.e., the will to truth seeks in all single world to obtain what it wants: the truth as something that does not change.²⁹ An error, according to Nietzsche, because the identity or something that does not suffer corruption was rejected such as the metaphysical world. In a sense, the scientific work, by using the Nietzschean philosophy, should assume another position: it should look at the truths with new eyes, considering its interpretations, as something temporary, above all, as something *human, all too human*.

Lastly, in Nietzsche the purpose of subsistence of the type is due to knowledge to be similar to “food”. A kind of food for the spirit (*Geist*, without any metaphysical sense), which is metaphorically comparable to the stomach: “[...] ‘spirit’ resembles a stomach more than anything” (BGE §230). After all, the scientific type uses the science as food to increase his power.

The possibility of several interpretations or perspectives is welcomed in Nietzschean philosophy. In *On the Genealogy of Morality*, Nietzsche says: “[...] the *more* eyes, various eyes we are able to use for the same thing, the more complete will be our ‘concept’ of the thing, our ‘objectivity’” (GM III §12). In this sense, the “objectivity” in Nietzschean philosophy means to have several perspectives on the same thing. Each perspective is the manifestation of impulses or wills to power. During a determined historical period, the mankind lives with/within several perspectives or “truths”. The Einsteinian and Newtonian theories are “true”. Of course, the Einsteinian theory contains further elements and it is more sophisticated than Newtonian theory. Then it is more “objective” (such as the dual aspect of the matter in quantum mechanics brings us a more “objective” look). But, such as any theory, it is still an interpretation and presents an increase of power to men who created/supported it. In Nietzschean philosophy, each perspective reflects the body plurality of the human body. That is, “our body is, after all, only a society constructed out of many souls” (BGE §19). In his immanent philosophy, soul means impulses or wills to power. Nietzsche has a plural vision, a perspectivist view on the “reality”.

²⁹Plato, in *The Republic* (VI, 485b), presents the philosopher’s nature and his love for the truth. The truth is indicated “as reality which always is, and which is not driven this way and that by becoming and ceasing to be”. This is a common position even today, and, according to this position, the truth is revealed by science because the true scientific theories work independently of the time. However the geocentric model worked during centuries and it is ruled out today.

5 Physics or science as a game

The world as a game may be read in several parts of Nietzsche's works. The young philosopher wrote already in 1872 the text *Homer's Contest*. The text indicates an aspect which remains unaltered in his mature works: the concept of *agon*. The Greek concept of *agon* indicates contest, dispute or struggle. For the mature Nietzsche, both the becoming and the *agon* are subsumed under the concept of will to power. The world as will to power means world as a game or play as well, as we can read in the cited fragment 38 [12] of 1885: the world "as a play of forces and force-waves [...]". These are the ingredients of his Dionysian world view. Nietzsche saw in Heraclitus a company, a thinker who claimed a similar point of view: "The affirmation of passing away *and destruction* that is crucial for a Dionysian philosophy, saying yes to opposition and war, *becoming* along with a radical rejection of the very concept of 'being'— all these are more closely related to me than anything else people have thought so far" (EH, *The Birth of the Tragedy* §3). The becoming as a game—both Nietzsche and Heraclitus are in agreement.³⁰ In a sense, a view which may be indicated even today, by using our cosmology. In Neves (2015), one shows that the Nietzsche's idea of Dionysian cosmology, with the concepts of becoming and struggle, may be approximated to the notions of the cosmological eras or eras of domination. In cosmology, the space-time fabric—and its dynamics, i.e., its expansion, contraction or staticity—is determined by the Friedmann's equations. Such equations give the dominant term which drives the space-time dynamics in a determined period. Each term is a cosmic fluid component. First, when the universe was young, the radiation dominated the expansion, then the matter. In our present time, the dark energy begins to dominate the cosmic expansion. This picture, somehow, indicates a game or struggle among the matter-energy forms (radiation, matter and dark energy). In each era, a determined form dominates. In a cyclic cosmology, the eras of domination alternate, the sequence radiation-matter-dark energy is repeated, and the *agon* is suggested. The world as a game is a good metaphor from this cosmological perspective as well.

As a part of the Dionysian world, the science is a result of contests as

³⁰In a fragment attributed to Heraclitus one reads: "Lifetime is a child at play, moving pieces in a game. Kingship belongs to the child" (Kahn, 1979, p. 71).

well. The *agon* or contest among scientific perspectives is determinant to the scientific development. As we have seen, science, in particular the physics, obeys rules. Then, such as the Dionysian world (which obeys rules or natural laws), science may be viewed as a game. This conclusion comes from the concepts of will to power and perspectivism: the scientific interpretations struggle for dominance. Such concepts lead to this interpretation. Science as a game means the most influential game today. And from the beginning of modernity, science is the most dominant game. Then the scientist is a type of player (someone who obtains in science the subsistence of the type) who is immersed in such a sophisticated game and, in general, does not realize that he/she plays it.

6 Final comments

Contrary to the common belief, Nietzsche was neither an obscure nor an irrationalist thinker. Maybe the reason for this opinion is found in his work. Writing in aphorisms, Nietzsche constructed a different work from the scientific model. Denying all powers to the reason, the philosopher pointed out to the limitations of the reason. However, the German philosopher, in his published work and posthumous fragments, exhibited admiration for science and its rationality. And with aid of natural sciences (*Naturwissenschaften*) concepts were created. In particular, with aid of physics, Nietzsche developed the concept of will to power. With the Boscovichean concept of force as more fundamental than the concept of matter, the German philosopher thought about the entire world—a world as forces in struggling.

His position on the nature of the reality is present. A philosophy without facts denies a world in itself or a thing-in-itself. The Nietzschean perspectivism is an epistemological option. “There is no facts, only interpretations” is the “fundamental true” in Nietzschean philosophy. Nietzsche stressed the perspectivistic view of the knowledge because “this world is will to power”, i.e., this world is plural, such as the interpretations in physics today.

“*Long live physics!*”,³¹ wrote the philosopher in *Gay Science*. There is no doubt on the physics influence on Nietzsche’s main concepts. Will to power and eternal recurrence depend on the physical concept of force to appear. But the contrary is not true. There is a lack of Nietzsche’s influence on

³¹See GS §335, where Nietzsche talks about the importance of the physicist’s honesty.

physics or physicists. However, in our point of view (a perspective), the Nietzschean perspectivism is a good option to interpret the modern results in physics to ban false dichotomies or the improbable final truth.

From the important concepts of will to power and perspectivism, I point out to an interpretation where science is viewed as a game. The Dionysian world reveals a world as contest, a game among wills to power. The multiplicity of perspectives in science, which obey determined rules, presents science as a game and the scientific activity as *agon*.

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